DR. FREDERICK G. COTTRELL

TURNING SMOKE and DUST INTO MONEY

By Robert H. Moulton

Scientist Has Discovered Way to Stop Enormous Waste of Fuel

AMERICA sends billions "up in smoke" yearly because of the enormous waste in the fuel used by our industries. On the other hand, there is a man in Washington who has discovered how to turn smoke into money and he is now busily engaged teaching the rest of the country how to perform the same trick. He does this by means of devices which, through electrical precipitation, not only reclaim vast wealth from the smoke, dust and fumes of smelters and other plants, but at the same time redeem thousands of acres of near-by land. As a matter of fact, the curb which he has put upon the smoke and dust nuisance—his original aim—now actually bids fair to be, in some directions, the primary reason for the running of certain of our industries. The smoke wizard who has accomplished these remarkable things is Dr. Frederick G. Cottrell, chief metallurgist of the bureau of mines.

Doctor Cottrell's experiments began several years ago when, as a member of the staff of the University of California, he was called upon to solve the problem of helping a smelter located on San Francisco bay. The waste gases and vapors from this smelter, resulting from the sulphuric acid parting process used in treating gold and silver bullion, were declared a nuisance by neighboring farmers and seemed likely to provoke costly litigation and possibly lead to a shutdown of the plant.

The gases discharged into the air amounted to substantially 5,000 cubic feet per minute and held in suspension an important proportion of sulphuric acid in the form of a fine mist. The corrosive action of the sulphuric acid was shown throughout the entire zone swept broadcast by the shifting winds, and both the agriculturists and the people generally had ample reason for complaint. The smelter was a profitable one and the management was anxious to find some way to abate a nuisance that was both a menace to health and hurtful to vegetation.

Laboratory Meets Industry.

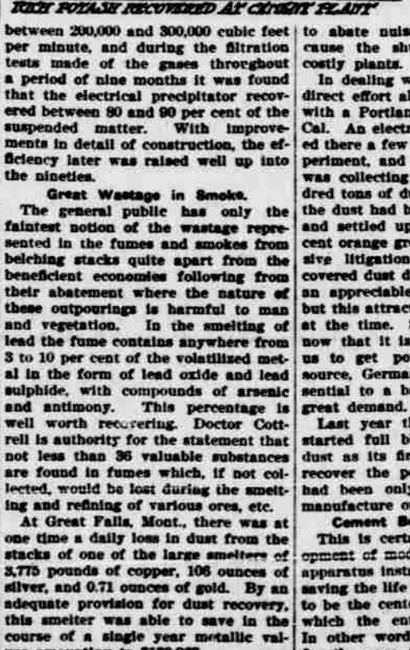
Doctor Cottrell's preliminary work brought up some puzzling situations. Up to a certain stage matters went well enough on the miniature scale of the investigational tests, but beyond this was the question of meeting the practical situation presented by a large commercial smelter. A big part of Doctor Cottrell's achievement lay in spanning the gap between the laboratory and the industrial plant and in finding ways to control the enormous pressures of the necessary electric current, mounting up to 100,000 volts.

The problem was solved, however, and so well was the precipitator installed at this smelter designed that it has been doing its work satisfactorily ever since. Further, by mere chance Doctor Cottrell attacked at that plant what is commonly admitted to be the most difficult of all problems of smoke or fume abatement, viz., the precipitation of acid mist.

The good results obtained in this first instance soon became widely known and a new line of application was opened a few years later when the great copper smelter at Balaklala, Cal., was threatened with fume litigation by the United States forestry service. "Fume," or fine particles in the form of smoke, and sulphur dioxide gas, invisible to the eye, given off from the stacks of the smelter, had swept the neighboring country bare of vegetation for miles, and it was a case of either a shutdown or a suppression of these destructive discharges.

A full-sized plant of the Cottrell type was, accordingly, installed. The volume of the gases treated averaged between 200,000 and 300,000 cubic feet per minute, and during the filtration tests made of the gases throughout a period of nine months it was found that the electrical precipitator recovered between 80 and 90 per cent of the suspended matter. With improvements in detail of construction, the efficiency later was raised well up into the nineties.

COTTRELL APPARATUS USED IN CALIFORNIA SMELTERY



RICH POTASH RECOVERED AT CEMENT PLANT

Great Wastage in Smoke.

The general public has only the faintest notion of the wastage represented in the fumes and smokes from belching stacks quite apart from the beneficient economies following from their abatement where the nature of these outpourings is harmful to man and vegetation. In the smelting of lead the fume contains anywhere from 3 to 10 per cent of the volatilized metal in the form of lead oxide and lead sulphide, with compounds of arsenic and antimony. This percentage is well worth recovering. Doctor Cottrell is authority for the statement that not less than 36 valuable substances are found in fumes which, if not collected, would be lost during the smelting and refining of various ores, etc.

At Great Falls, Mont., there was at one time a daily loss in dust from the stacks of one of the large smelters of 3,775 pounds of copper, 106 ounces of silver, and 0.71 ounces of gold. By an adequate provision for dust recovery, this smelter was able to save in the course of a single year metallic values amounting to $130,263.

The blighting gas, sulphur dioxide, given off from the stacks of copper smelters can be transformed into useful substances by turning the gas into sulphuric acid or sulphur. Sulphuric acid is largely made here by treating pyrites, and we now consume annually in the neighborhood of 6,250,000 tons of 50 per cent sulphuric acid. To a great extent this corrosive fluid is a prime constituent in the preparation of fertilizers, especially where phosphate rock is treated for this purpose. It is also used in converting the ammonia by-products of cooking ovens into ammonia sulphate. Sulphuric acid is in great demand by explosive factories, oil refiners, steel mills and varied industries engaged in the making of heavy chemicals. Sulphuric acid is likewise extensively employed by smelters and the latter are paying as high as $30 a ton today for the stuff. Sulphur dioxide is used in the preparation of wood pulp for paper making, both as a disintegrating and bleaching agent.

In dealing with noxious or objectionable gases not necessarily harmful a new aspect of precipitation arises. The electrical treater can handle only fluids or substances in the shape of particles and cannot cause the precipitation of gases, per se. But these gases can be made to condense upon mists in the form of steam or finely sprayed water or upon extremely fine powder or dust purposely thrown into the sweep of the gases to effect this. In this way it is possible to deal with varied conditions and to abate nuisances that bid fair to cause the shutdown or removal of costly plants.

In dealing with dust alone, the first direct effort along this line had to do with a Portland plant near Riverside, Cal. An electrical treater was installed there a few years ago by way of experiment, and a couple of years later was collecting something like a hundred tons of dust daily. Prior to that the dust had been scattered broadcast and settled upon the groves of adjacent orange growers, leading to extensive litigation. Analysis of the recovered dust disclosed the presence of an appreciable percentage of potash, but this attracted no marked attention at the time. Since then, particularly now that it is no longer possible for us to get potash from our prime source, Germany, this element so essential to a balanced plantfood is in great demand.

Last year the plant at Riverside started full blast to actually create dust as its first concern in order to recover the potash which previously had been only a by-product in the manufacture of cement.

Cement Becomes By-Product.

This is certainly a romantic development of modern industry, where an apparatus installed for the purpose of saving the life of the factory turns out to be the center of operations around which the entire plant is adjusted. In other words, the cement becomes for the once the by-product and the profits on the potash furnish an ample revenue, while the cement is just so much additional gain.

Anyone at all familiar with the average cement plant and the gray powdered appearance of the near-by territory can realize the boon that would be conferred by the general adoption of electrical precipitators not only in preventing the escape of the dust but in saving the potash which is so much desired.

Perhaps the most interesting part of the whole story of Doctor Cottrell's success is the fact that he has presented to Smithsonian institute at Washington all of his valuable patents relating to the electrical precipitation of dust, smoke and fumes. The purpose of this munificence on his part was that any profits resulting from the practical application of the patents should go to the upbuilding of a fund to aid in the advancement of scientific research. In short, to help genius and to develop inventions where the needful financial aid might otherwise be lacking.

Character Told by Tongue.

Someone has discovered a new science that he has named "Glossomancy." Americanized, it is tongueology. The owner of a short broad tongue is untruthful and unreliable. The owner of a long broad tongue is shallow, superficial and a great talker. The owner of a small, round and plump tongue is mediocre, commonplace and colorless. The owner of a short and narrow tongue is quick-tempered yet affectionate and as sudden in hate as in love. The owner of the long and moderately pointed tongue is frank, loving, truthful and affectionate. Now all this may or may not be true, but I will advise you, young man, to quit eye-gazing and study her tongue.—Scoiopo, the Scribe.

Caillaux's Aplomb.

There is going the rounds in Paris a characteristic story of M. Caillaux. The other Sunday afternoon he appeared for the last time before the committee of eleven, charged with investigating his case. He had, as usual, staggered every one with the absolute coolness with which he met all charges. But when he left the chamber, in the darkness and falling snow, no cab was to be found. "Bapriest," cried the deputy, as he looked in vain for a friendly "fiacre." Then an idea struck him, and he approached a motorcar containing detectives. "It is you who are shadowing me?" he questioned. "Yes, monsieur." "Very well, then; take me home," said M. Caillaux, as he entered the police car.—London Chronicle.

GOOD ROADS

GOVERNMENT ASKED TO HELP

Proper Construction and Maintenance of Roads Demanded by Conditions of Great War.

"That the effective conduct of the war demands immediate attention to proper construction and maintenance of the highways of the country is a plain statement of facts," asserts Chairman George P. Coleman of the American Association of State Highway Officials.

"Never before has there been such urgent need of a comprehensive and definite policy for road and street construction and maintenance as is the case at present, and, in making their request to the United States government to formulate and promulgate at the earliest hour a plan which shall be countrywide in its character, the state highway officials believe that they are expressing the concensus of opinion of all citizens interested in roads progress intended to encompass the greatest economic and military value in conserving the resources of the country and facilitating the highways transportation of freight.

"In our appeal to W. G. McAdoo, director general of railroads, we have included a special petition that freight cars shall be furnished early in the spring for transportation of the necessary materials entering into the building of main artery roads which command a priority of attention. We are going to be exceedingly hopeful that the director general will recognize the interrelated needs of railroads and highways, enabling the road arteries of communication to serve a maximum help in relieving the rail lines of their present overload."

GOOD ROADS IN CONNECTICUT

Excellence Due to Efficient Maintenance Under Extremely Heavy Traffic Conditions.

The main roads of Connecticut have long been famous for their excellence, a condition due to their efficient maintenance under heavy traffic as well as to their original good construction. State Highway Commissioner Bennet has organized a special branch of his bureau to attend to this maintenance, so that there is no divided responsibility for results. It is under a superintendent of repairs, W. Leroy Ulrich, who recently explained how the good results are attained. The state has been divided into ten districts. Any part of each of them can be easily reached from a central point, where the office of the district supervisor of repairs is located. Each district is divided into sections, each in charge of a foreman. These foremen sometimes

Building Asphalt Pavement.

have charge of 10 to 15 men, depending upon the season of the year and the work to be done. In addition each district has one or more gangs transferred from place to place to carry on reconstruction, oiling and other work which is occasionally needed in such amounts that the section forces are unable to perform it without neglecting other duties. This bureau handles all the maintenance and small reconstruction work of the state and keeps the roads in good condition until long stretches become so worn that their reconstruction by contract is more economical than further maintenance.

Trees Along Highways.

The highway commissioner of Pennsylvania suggests that trees planted along highways should be fruit or nut bearers. This would make fine picking for tourists and small boys.

Ruin Asphalt Pavements.

Asphalt pavements are softened and sometimes disintegrated by illuminating gas leaking from mains beneath them.

Expansion of Concrete.

Concrete roads expand most in winter and contract most in summer, according to the United States bureau of standards, because of increases or decreases in the moisture they contain.

Good Qualities of Horse.

Part of the stamina, durability and spirit of a horse is inherited and part is produced through proper feeding.

Bad Roads Expensive.

Bad roads are the heaviest expense that production is required to meet.

PRETTY MOTOR DRIVER TRAINING FOR WAR

The photograph shows Miss Marion Olsen, one of the prettiest of the women motor drivers training with the woman's motor corps of America and hopes to be sent to France for duty near the battle front. The young lady is an expert driver and mechanic and has been active in recruiting work in New York.

HOW AUTOMOBILE MAY BE LEARNED

Initial Lesson in Handling Machine Should Be How to Stop Quickly.

STARTING NOT SO IMPORTANT

Make Numerous Attempts to Bring Car to Standstill Until Confidence Is Gained—Measure Distance Accurately.

Running an automobile through traffic is like swimming in deep water. Don't do it until you are so sure of yourself that all danger of panic has gone by. And always expect the unexpected. Leave your family or friends at home on those first few rides.

Initial Lesson.

As your initial lesson, after you have learned the names, and above all the potentialities of the various levers, learn how to stop. Of course, as a preliminary, you must start, but that can be at your leisure. Make a dozen—or even a hundred attempts to bring the car to a standstill until you have gained confidence. Then adventure along some quiet, unobstructed road.

After you have received some instruction about the general mechanism of the car, practice stopping suddenly before reaching imaginary dangers along the road. Don't wait for this lesson until a child, a chicken, an absent-minded saunterer or some other irresponsible live thing sends your brand-new knowledge helter-skelter.

Measuring Distance.

Measuring distance accurately is the most important feature of driving. Draw two lines across the road fifty feet apart. Then, going at the rate of twenty miles an hour, apply the brake and see how long it takes you to stop the car. When you discover how much over the fifty-foot line your automobile goes, you realize the necessity for the driver's first rule—caution.

This trial also teaches you what speed is safe in approaching railroad crossings and intersecting streets, and how near you can go to traffic before applying your brake.—Popular Science Monthly.

TO FIX BATTERY CONNECTION

Stripped End of Wire Should Be Wound Around Binding Post in Clockwise Direction.

In making an ordinary connection to a battery terminal, the stripped end of the wire should be wound around the binding post in a clockwise direction. When the screw is tightened, it will be turned to the right and with the wire wound in the same direction, there is a tendency for it to wrap all the tighter around the post. When the wire is wrapped the other way around, it tends to unwrap when the screw is tightened.

Oil Brakes Sparingly.

It has been well said that there is one set of bearing surfaces on a car which should never be oiled—the brakes. This is not strictly true, as a squeaking brake must be oiled, but with caution. Use castor oil in moderation until the squeak is stopped.

NEW HEADLIGHT FOR AUTOS

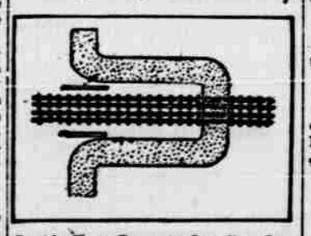
Connected With Front Axle and Always Points in Same Direction With Front Wheels.

The latest development in automobile lighting is a headlight which always points in the right direction. Every motorist has known the annoyance which arises in turning corners, when the front wheels are pointed in one direction and the headlights in another, and the country to left or right is lighted, while the road he wants to travel is dark. The new headlight is connected with the front axle in such a way that it turns with the front wheels instead of with the body of the car, and always points in the direction the wheels are pointed, which is, of course, the path that the car will travel.

SLOWING DOWN AT CROSSING

Unique Plan to Prevent Autoists Dashing Upon Tracks Already Occupied by Train.

Patent papers have been granted on a unique plan to prevent autoists dashing upon railroad tracks already occupied by a train. The plan might arouse the ire of the automobilist, but it would probably make it impossible for these accidents to occur. The idea consists of making a sharp curve in the road at



Double Turn Prevents Speeding Over Railroad Tracks.

a point just before the tracks would be reached under ordinary circumstances, so the chauffeur is compelled to slow up and make two turns before getting on the track. While performing this evolution it is thought that there would be ample opportunity for observing the approach of a train in either direction.

WATER AS CARBON REMOVER

Highly Recommended and Really Effective—Old Timer Describes Simple Method.

Water is a highly recommended and really effective carbon remover. It is the best, old-timers say. One man advises a simple method: "When your motor is running idle, speed it up until the air valve in the carburetor opens. Take a syringe, about the size of a hypodermic syringe, and inject water slowly into the carburetor. Do this four or five times, and you will see the carbon in huge chunks come out through the exhaust."

Spinning Wheels.

When the rear wheels are in a muddy spot, do not try to drive the car out by spinning them. The slower the wheels turn the better the chance of gripping the surface. If the car can be rocked by alternately engaging and disengaging the clutch it will be found that the pendulum action of the car will carry it out of almost any bad spot.

All Knitting.

Jane—Do you knit?

Susie—No.

Jane—Get busy, kid; even bones knit.

A New Man.

Son and heir was in one of his moodiest moods, asserting that he was not going to be this, that or the other when he grew up; he was going to be something else. Auntie feigned all interest and begged to know what he was going to be.

"I'm going to be a big papa, and not work at all."

"Oh, you don't mean that? Not work at all? I never heard of a papa not working at all," auntie exclaimed.

"No, I'm not going to work at all. Just going to stay at home and be a new papa." At this auntie burst out laughing and said:

"Oh, you mean you're going to be a sort of new woman?"

"No, no, no," the tot retorted. "I'm going to be a new man."

The Infant Mind.

"Where are you going, mamma?"

"To a surprise party, dear."

"Can't I go, too, and Archie and Edna?"

"No, dear, you weren't invited."

"Well, don't you think they'y be lots more s'prised if you took us all?"—Boston Evening Transcript.

Vindictive.

Friend—What would you like best to plant this year?

Farmer—My summer visitors.

Her conversation is naturally flowery when a girl talks through her Easter hat.